

ACCESSION #: 9606240286

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Limerick Generating Station, Unit 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000352

TITLE: Automatic Reactor Scram During Functional Testing of the  
RPS MSIV Closure Trip Channels Due to Less Than Adequate  
Procedural Guidance.

EVENT DATE: 05/21/96 LER #: 96-013-0 REPORT DATE: 06/20/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J.L. Kantner - Manager, TELEPHONE: (610) 718-3400

Experience Assessment, LGS

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On May 21, 1996, while performing Reactor Protection System (RPS) channel functional testing related to Main Steam Isolation Valve (MSIV) closure, a Unit 1 reactor scram occurred during closure of the 1B inboard MSIV. The Surveillance Test (ST) procedure for this testing directs the operator to partially close the MSIV using the test push button until either a half scram signal is generated or until an unexpected increase in reactor

pressure occurs. When the expected half scram signal did not occur and an unexpected increase in reactor pressure was observed, the Reactor Operator immediately released the test push button. The MSIV continued to close due to the differential pressure across the valve caused by the increasing reactor pressure. The reactor scram occurred due to high neutron flux and increased reactor pressure. The plant responded as designed to these scram signals. The cause of the reactor scram was inadequate procedural guidance and an undetermined equipment malfunction. Two relays involved in the testing were replaced with new relays. The ST procedures will be revised to ensure that appropriate barriers are in place to minimize the risk of a reactor scram during RPS-MSIV closure testing.

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#### Unit Conditions Prior to the Event

Unit 1 was in Operational Condition (OPCON) 1 (Power Operation) at 100% power level. There was no system, structure, or component out of service which contributed to this event.

#### Description of the Event

At 2238 hours on May 21, 1996, during the performance of Instrumentation and Controls (I&C) Surveillance Test (ST) procedure ST-2-041-619-1, "RPS-MSIV Closure Div. IIB Channel B2 Functional," a full reactor scram, i.e., a Reactor Protection System (RPS, EIIS:JC) actuation, occurred due to the closure of the 1B inboard Main Steam Isolation Valve (MSIV, EIIS:ISV), HV-041-1F022B. The purpose of the ST procedure is to test the generation of an RPS channel half scram signal based on MSIV closure to below the "92% open" position. For the B2 RPS channel, the 'B' and 'D' MSIVs are required to close to cause the half scram signal. During performance of the ST procedure, an I&C technician uses a test switch in the Auxiliary Equipment Room (AER) to simulate closure of one MSIV by de-energizing one of the RPS relays. The other MSIV is manually closed

to below the "92% open" position. The ST procedure directs the operator to close the MSIV using the slow close test push button until either a half scram signal is generated or until an unexpected increase in reactor pressure occurs.

A pre-job briefing was held in the Main Control Room (MCR) with the Reactor Operator (RO), Shift Supervisor, Shift Manager and I&C technicians. The briefing addressed the parameters to be monitored, and the expected response. A similar test of another instrument channel was successfully performed without incident. Operators were positioned to test the 1B inboard MSIV and monitor reactor response, especially reactor pressure. The Shift Supervisor was directing the test performance, and the Shift Manager was observing the test. One I&C technician was in the AER, with a copy of the correct ST procedure, to operate test switches and observe indications. Another I&C technician was in the MCR, also with a correct copy of the ST procedure, and was in constant communication with the technician in the AER. The Operations Services Manager was on shift performing a backshift management observation, and was also observing the test in the MCR.

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The I&C technician in the AER placed the test switch in the proper position, and communicated this to the other I&C technician in the MCR.

The I&C technician in the MCR then informed the MCR operators. The RO at control panel 10C601 initiated closure of the 1B inboard MSIV at 22:38:02

hours. Approximately 30 seconds later, the RO monitoring reactor pressure at the 10C603 reactor console notified the RO stroking the MSIV that reactor pressure had increased to 1048 psig, a three (3) psig increase. At that time, the high reactor pressure alarm annunciated and the RO stroking the 1B MSIV released the test push button to reopen the valve. However, the valve continued to close due to the increasing pressure drop across the valve because of the increasing reactor pressure. Reactor pressure was increasing at a rate of approximately 10 psig per second. The expected B2 channel half scram signal did not occur prior to the RO releasing the test push button.

Approximately three (3) seconds later, B1 and B2 RPS channel half scram signals occurred as a result of the 1F Average Power Range monitor (APRM) exceeding the scram setpoint of 112 percent. At 22:38:38 hours, an A2 RPS channel half scram signal occurred on reactor pressure above the scram setpoint of 1096 psig. The combined signals resulted in a full reactor scram. Transient Response Implementation Plan (TRIP) procedure T-101, "RPV Control RC/Q, RC/L, RC/P," was entered, the reactor mode switched was placed in the shutdown position, and the MSIV testing was aborted.

A four hour notification was made to the NRC at 0006 hours on May 22, 1996, in accordance with the requirements of 10CFR50.72(b)(2)(ii) since this event involved an automatic RPS actuation. This report is submitted in accordance with the requirements of 10CFR50.73(a)(2)(iv).

## Analysis of the Event

The consequences of this event were minimal and there was no release of radioactive material to the environment as a result of this event.

B1 and B2 RPS channel half scram signals occurred due to the 1F APRM exceeding its scram setpoint of 112 percent of reactor power. All other APRMs peaked at 112 percent. An A2 RPS channel half scram signal occurred due to the A2 channel high reactor pressure trip peaking at 1097.3 psig. All other high reactor pressure channels remained below the scram setpoint of 1096 psig. The plant responded as designed to

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the high neutron flux and high reactor pressure scram signals. All control rods properly inserted in response to the scram signal. Had the automatic reactor scram failed to occur, the reactor could have been manually scrammed by the RO at the 10C603 console in accordance with the appropriate operating procedures.

The maximum reactor pressure observed in response to this event was well below the Technical Specifications (TS) Safety Limit of 1325 psig as measured in the reactor steam dome. All 14 main steam relief valves were operable and would have lifted as necessary to maintain reactor pressure below the Safety Limit.

## Cause of the Event

The cause of the reactor scram was inadequate procedural guidance and an undetermined equipment malfunction. The ST procedure contains a caution

statement to warn the operator to release the test push button if an RPS trip, i.e., a half scram signal, occurs or an unexpected reactor pressure increase occurs. This caution is located just prior to the step that directs closure of the MSIV. In comparison to other testing, a 5 psig increase in reactor pressure is expected during monthly main turbine control valve testing at 92% reactor power, and a 14 psig increase in reactor pressure is expected during weekly main turbine stop valve testing at 98% power. In this particular situation, the expected RPS channel half scram signal was not received, and Operations personnel interpreted the increasing reactor pressure at 3 psig above normal as unexpected. By the time this condition had occurred, reactor pressure was increasing at a rate of 10 psig per second. When the operator released the test push button, the increasing reactor pressure forced the valve to continue to close before the valve eventually returned to the open position.

Interviews with personnel involved immediately after the event confirmed use of the correct revision of the ST procedure, correct test switch positioning in the AER, and proper procedural compliance. This was confirmed through Operations management oversight of the conduct of the test. Therefore, personnel performance was determined not to be a contributing factor in this event.

Troubleshooting to determine the cause of the failure to receive the expected B2 RPS channel half scram signal was inconclusive. The

following components were evaluated.

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- Two RPS relays involved in this testing were replaced with new relays. The removed relays were analyzed and found to be functioning properly. No evidence of failure could be established.
- The limit switch on the 1B inboard MSIV was successfully tested four times following the event. It was also successfully tested during the Post Maintenance Test (PMT) for the replacement of the two relays. The limit switch was visually verified through the use of a camera in the drywell to be mounted securely and the lever arm operated smoothly with no binding.
- The test switch in the AER was successfully tested four times following the event. It was also successfully tested during the relay replacement PMT and approximately forty additional times after the relay replacement PMT.
- The RPS-MSIV scram bypass relay was verified to operate properly via the MCR alarms that annunciated during the event. This relay also functioned properly during the relay replacement PMT and approximately fifty additional times after the relay replacement PMT.

#### Corrective Actions

The RPS-MSIV closure ST procedures will be revised to confirm the appropriate relay is de-energized when the test switches are placed into

the test condition. In addition, these ST procedures will be revised to ensure that appropriate barriers are in place to minimize the risk of a reactor scram during RPS-MSIV closure testing. These procedure changes are expected to be completed by July 15, 1996. RPS-MSIV testing has been placed on hold until the barriers are in place.

Possible mechanical problems associated with the B2 RPS channel half scram signal have been evaluated, and associated equipment was tested and determined to be functioning properly. As a conservative measure, two of the RPS relays involved in the RPS-MSIV closure testing were replaced with new relays, and the limit switch, test switch and scram bypass relay described above are scheduled to be replaced.

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Previous Similar Occurrences

None

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610 718 2000

10CFR50.73

June 20, 1996

Docket No. 50-352

License No. NPF-39

U.S. Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, DC 20555

SUBJECT: Licensee Event Report

Limerick Generating Station - Unit 1

This LER reports an automatic Unit 1 reactor scram, a Reactor Protection System (RPS) actuation, resulting from high neutron flux and high reactor pressure during functional testing of the RPS Main Steam Isolation Valve closure trip channels. The cause of the scram was inadequate procedural guidance and an undetermined equipment malfunction.

Reference: Docket No. 50-352

Report Number: 1-96-013

Revision Number: 00

Event Date: May 21, 1996

Report Date: June 20, 1996

Facility: Limerick Generating Station

P.O. Box 2300, Sanatoga, PA 19464-  
2300

This LER is being submitted pursuant to the requirements of  
10CFR50.73(a)(2)(iv).

Very truly yours,

cc: T. T. Martin, Administrator Region I, USNRC

N. S. Perry, USNRC Senior Resident Inspector, LGS

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